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New species of the genus *Trivellona* (Mollusca: Gastropoda) from the Miocene of Australia[1]

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Abstract – Three new species of fossil Triviidae – *Trivellona darraghi*, sp. nov., *Trivellona kendricki*, sp. nov. and *Trivellona lochi*, sp. nov. – are described from the Balcombian of the Otway Basin, Victoria. The Australian fossil species involve the largest recorded size for Triviidae. Recent Triviidae are always less than 30 mm with most species generally less than 10 mm although *Trivellona darraghi* reaches almost 50 mm. These new species differ from the Bairnsdalian *Trivellona avellanoides* (McCoy, 1867) by their more numerous and more close-set shell ribs.

INTRODUCTION

A recent review of the fossil and Recent species of the deep water gastropods of the genus *Trivellona* (Fehse and Grego 2004) revealed a more diverse fauna than monographed by Schilder (1935, 1966). In 1935 Schilder described *Trivellona transiens*, *T. subtilis* and *T. tatei*, species that may reach a maximum of 10 mm in length. Schilder (1966) later described *T. daphnes* (Figure 3 M, O, Figure 5 B), which was found to be similar to *T. avellanoides* (McCoy, 1867) (Figures 4M–P, 5A). Both *T. avellanoides* and *T. daphnes* belong to the larger-shelled fossil species with shell lengths between 20 and 30 mm. The number of dorsal ribs[2] in both taxa is always significantly less than 30, and the ribs are widely spaced.

Re-examination of the type material of *T. avellanoides* and *T. daphnes*, together with a wider range of additional specimens, has led us to conclude that three species from Clifton Bank, Muddy Creek differ sufficiently and consistently from all other in the genus to justify their recognition as new species which are described herein. *Trivellona darraghi* sp. nov. is the largest recorded triviid with a shell length of almost 50 mm. This species is most similar to the recent *Trivellona* cf. *kiiensis* (Kuroda and Cate *in* Cate, 1979) from deep water off Aliguay Island, Philippines. *Trivellona lochi* sp. nov. is somewhat smaller than *T. darraghi*, and exhibits an intermediate morphology between the Miocene *T. daphnes* (Schilder) and the extant *T. opalina* (Kuroda and Cate *in* Cate 1979). Finally, the third new species *Trivellona kendricki*, sp. nov., represents the smallest species of the three new taxa, and possesses the most pyriform shell. All three species are characterised by very numerous and close-set dorsal ribs.

Trivellona avellanoides and *T. daphnes* from "Grice Creek" (= Gunyoung Creek) are from the Fyansford Formation and are of Bairnsdalian Age (Darragh 1985: 104), that is post-Balcombian. Gunyoung Creek is the official, correct name of the locality once known as Grice or Grice's Creek[3]. The geology of the area is described in Gostin (1966).

The specimens examined in this study are lodged in the following institutions: collection of Dirk Fehse, Berlin, Germany (DFB); Museum Victoria, Melbourne, Australia (NMV).

Dimensions

Length refers to the greatest anterior/ posterior measurement. Width refers to the greatest lateral (left-right) measurement with the shell at rest on the ventrum. Height refers to the maximum globosity from the ventrum through to the dorsal extremity. Columellar respectively labral denticles at the anterior and posterior end of the parietal respectively labral lip have been counted as full teeth. The count of the dorsal ribs follows the definition by Schilder (1933, p. 288, text-fig. 6).

[1] Contribution to the knowledge of Triviidae (Mollusca: Gastropoda). Part XVIII.

[2] The number of dorsal ribs is defined after Schilder (1933, p. 288, text-fig. 6).

[3] Darragh (2002: e.g. 367), however, still used the name Grices Creek.

SYSTEMATICS

Family Triviidae Troschel, 1863

Genus *Trivellona* Iredale, 1931

Type species
Trivellona excelsa Iredale, 1931, by original designation.

Trivellona darraghi sp. nov.
Figures 1, A–V, 2, A–T, Figure 5E

2004 *Trivellona* sp. indet. F: Fehse and Grego: 23, plate 28, fig. 116.

Material examined

Holotype
Australia: *Victoria*: from Clifton Bank, 'Clifton' property, Muddy Creek, Yulecart via Hamilton, date unknown, Mrs M. Robertson. NMV P312638. Muddy Creek Formation, Balcombian, Middle Miocene.

Paratypes
Australia: *Victoria*: 2 specimens, from the type locality, date and collector unknown (DFB 1319A/B); 1 specimen, from the type locality (NMV P312635); 4 specimens, from the type locality, date unknown, Mr G.B. Pritchard (NMV P312636, P312649, P312808, P314878); 1 specimen, from the type locality, June 1957, R. Blackwood (NMV P312637); 2 specimens, from the type locality, date unknown, Mrs M. Robertson (NMV P314872, P314873); 2 specimens, from the type locality, date unknown, Mr J.H. Young (NMV P312642, P312643); 1 specimen, from the type locality, date unknown, Mr G. Sweet (NMV P312645). Muddy Creek Formation, Balcombian, Middle Miocene.

Other material
Australia: *Victoria*: 2 specimens, from the type locality, date unknown, Mr G.B. Pritchard (NMV P312634, P312807); 8 specimens, from the type locality, date unknown, Mr G. Sweet (NMV P312641, P314875, P314876, P314877, P312646A-B, P312647, P312648). Muddy Creek Formation, Balcombian, Middle Miocene.

Diagnosis
Shell large for genus, elongated. Spire elevated. Ventrum strongly convex. Labrum ventrally, angularly rounded, anteriorly flattened. Outer labral margin ridged. Inner fossular margin projected.

It differs from *T. avellanoides* (McCoy, 1867) and *T. daphnes* (Schilder, 1966) by the larger, somewhat rectangular, shell outline, the more numerous, close-set ribs and the projected inner fossular margin. The new species has often been misidentified as *T. transiens* or *T. subtilis* but these two species are immediately recognisable by their smaller size, since most specimens do not exceed 10 mm. See Table 4 for other distinguishing features.

Description
Shell medium to large sized, lightweight, somewhat fragile, globose. Spire elevated, covered by 5 to 7 terminal ribs. Body whorl somewhat pyriform, globose, rounded, approximately 90% of total shell height; anterior terminal produced, tip blunt; posterior terminal slightly so. Anal canal and posterior terminal tip almost obscured. Dorsum evenly rounded, highly elevated, completely covered by 22 to 26 fine ribs with a mid-dorsal depression; at times ribs bisected by a smooth mid-dorsal area. Ventrum convex, with terminal collars straight. Aperture relatively narrow, straight, abapically curved. Labrum narrow, straight at its

Table 1 Dimensions of *Trivellona darraghi* sp. nov.

Specimens (catalogue numbers)	Length	Width	Height	Columellar teeth	Labral teeth	Dorsal ribs	
NMV P312638	31.0	24.2	21.0	23	30	26	H
DFB 1319A	31.1	22.8	20.1	23	29	22	P1
DFB 1319B	25.3	19.5	15.9	24	31	24	P2
NMV P312635	27.5	19.9	16.7	25	33	24	P8
NMV P312636	~49	30.9	–	24	35	–	P7
NMV P312637	19.0	13.4	11.3	21	**23**	22	P6 ♂?
NMV P314872	~31.4	24.0	21.0	26	32	24	P4
NMV P314873	32.5	23.7	20.4	25	35	–	P10
NMV P312642	~46	~33.5	27.1	–	–	–	P12
NMV P312643	30.8	22.2	19.7	24	34	22	P9
NMV P312645	33.8	25.5	22.5	23	29	–	P11
NMV P312649	25.7	19.6	16.8	–	28	26	P13
NMV P312808	~33.0	24.3	21.1	26	33	22	P3
NMV P314878	27.7	20.1	17.3	24	29	26	P5

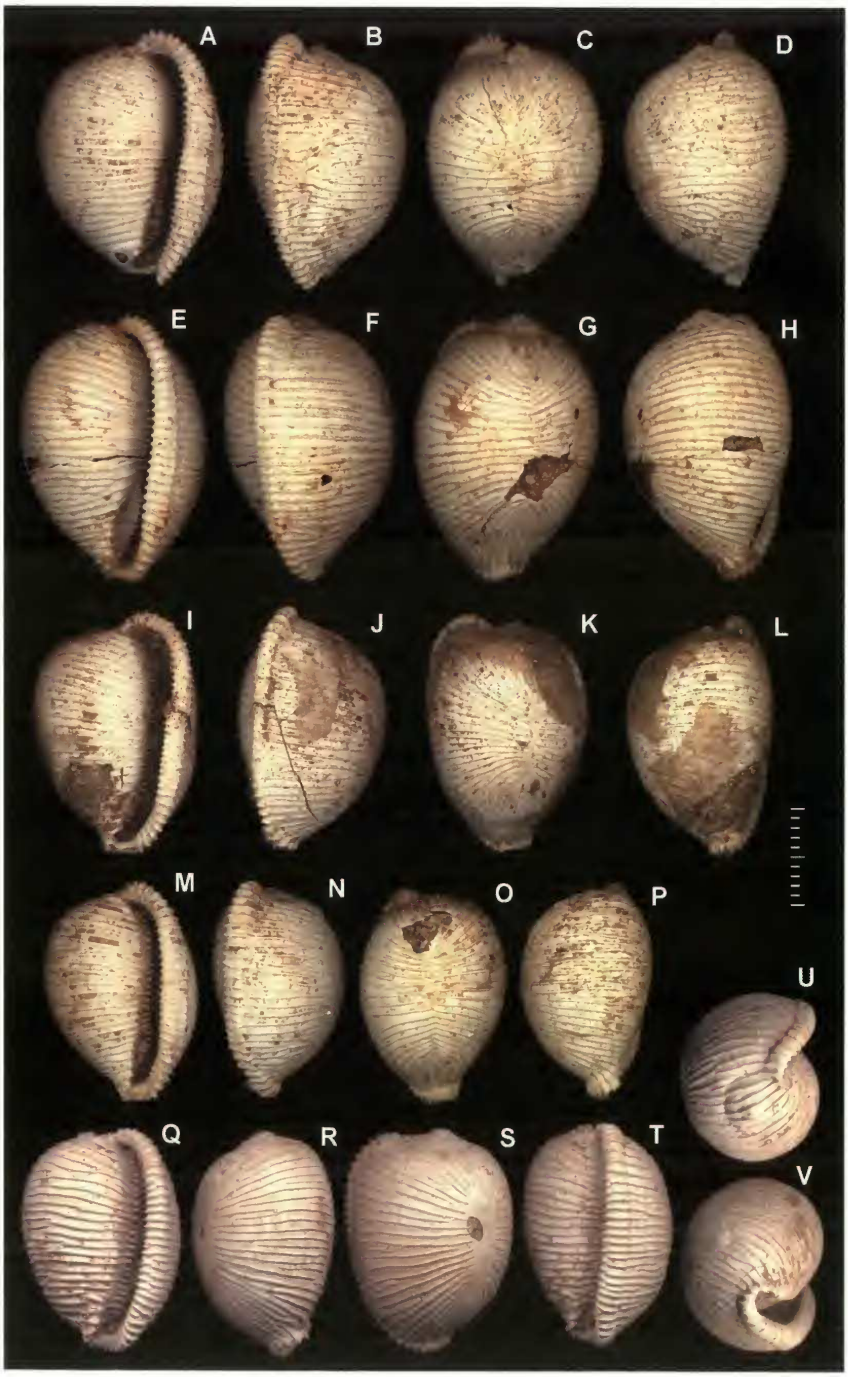

Figure 1 A–V, *Trivellona darraghi* sp. nov. from Clifton Bank, Muddy Creek, Yulecart via Hamilton, Victoria, Australia (probable mature female specimens): A–D NMV P312808, paratype 3, × 1.2; A ventral, B left lateral, C dorsal, D right lateral. E–H NMV P312645, paratype 11, × 1.2; E ventral, F left lateral, G dorsal, H right lateral. I–L NMV P312643, paratype 9, × 1.2; I ventral, J left lateral, K dorsal, L right lateral. M–P NMV P314878, paratype 5, × 1.2; M ventral, N left lateral, O dorsal, P right lateral. Q–V DFB 1319A, paratype 1, × 1.2; Q ventral, R left lateral, S dorsal, T right lateral, U apical, V abical.

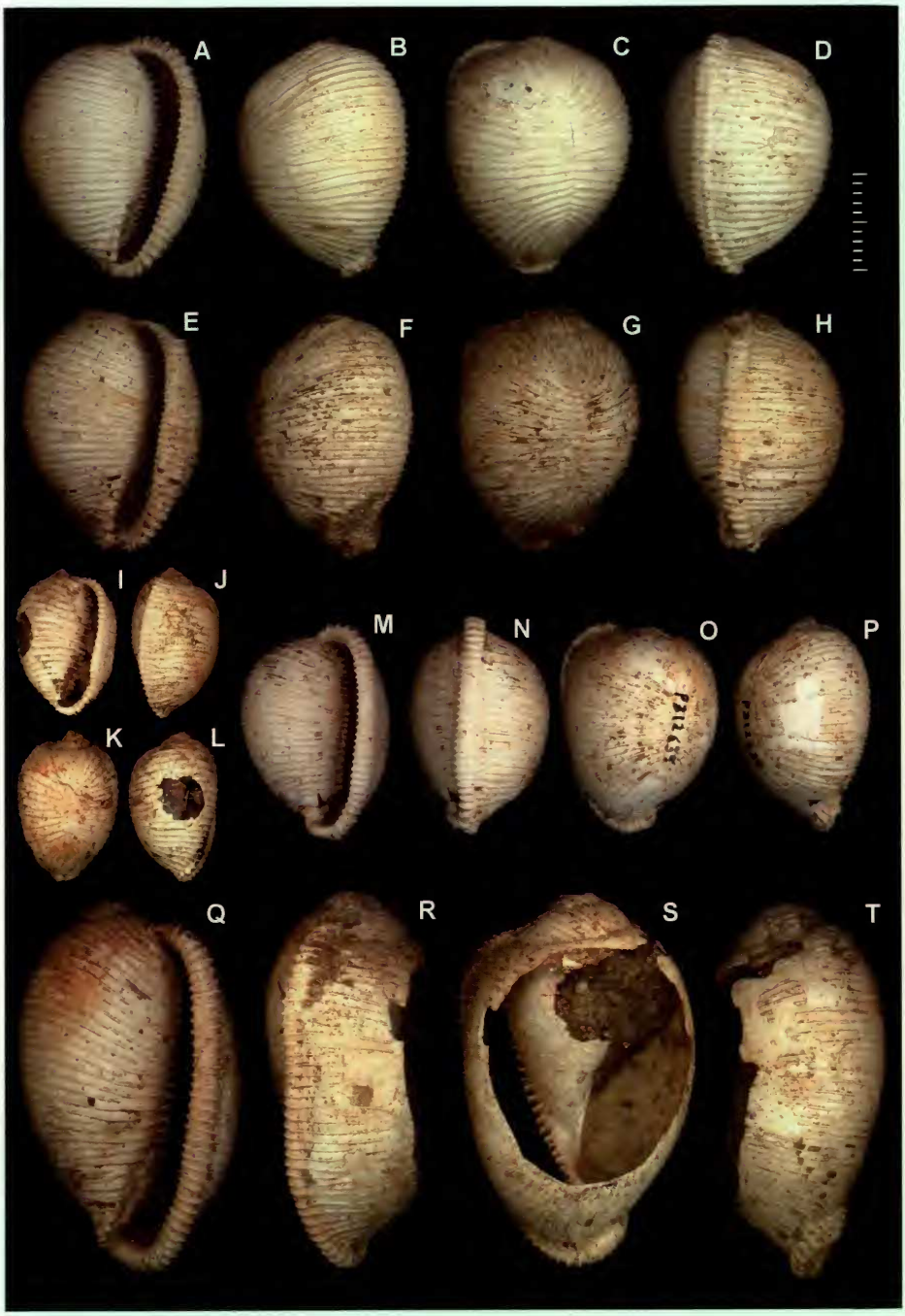

Figure 2 A–T, *Trivellona darraghi*, sp. nov. from Clifton Bank, Muddy Creek, Yulecart via Hamilton, Victoria, Australia: A–D NMV P312638, holotype, × 1.2; A ventral, B left lateral, C dorsal, D right lateral (probable mature female specimen). E–H NMV P314872, paratype 4, × 1.2; E ventral, F left lateral, G dorsal, H right lateral (probable mature female specimen). I–L NMV P312637, paratype 6, × 1.2; I ventral, J left lateral, K dorsal, L right lateral (probable mature male specimen). M–P NMV P312635, paratype 8, × 1.2; M ventral, N left lateral, O dorsal, P right lateral (probable mature female specimen). Q–T NMV P312636, paratype 7, × 1.2; Q ventral, R left lateral, S dorsal, T right lateral (probable mature female specimen).

mid-portion, curved anteriorly and posteriorly, posteriorly projecting, roundly keeled on ventrum, anteriorly flattened, bearing on its inner margin (23) 29 to 35 fine denticles (see Table 1). Outer margin of the lip slightly, angularly callused with a sharp ridge on shoulder. Siphonal and anal canals following shell profile; bordered adapically and abapically by weak ventral side walls. Columella narrow, straight, tapering steeply inwards, bordered internally by a carinal ridge. Parietal lip anteriorly ridged, bearing 21 to 26 ribs (see Table 1), which continue onto the carinal ridge, where they are slightly T-shaped. Fossula broadly concave, not clearly delimited from the rest of the columella. Inner fossular edge slightly protruding.

Etymology

The name of the species honours Dr Thomas A. Darragh, Museum Victoria, Melbourne, Australia.

Remarks on shell morphology

The shell thickness also of the largest paratype is 0.2 mm. This might indicate that all large shelled *Trivellona* species of the Australian Miocene were inhabitants of bathyal waters like observed in recent species (Fehse and Grego 2004).

Sexual dimorphism in the Triviidae has not been studied yet. However, the paratype 6 of *Trivellona darraghi* with its length of 19 mm would strongly suggests that short specimens are males. A similar situation is found in the Ovulidae (Dr Felix Lorenz, pers. obs. and comm.).

Trivellona lochi sp. nov.

Figures 4A–L, 5D

Material examined

Holotype

Australia: *Victoria*: from Clifton Bank, 'Clifton' property, Muddy Creek, Yulecart via Hamilton, date unknown, Mr G. Sweet (NMV P312644). Muddy Creek Formation, Balcombian, Middle Miocene.

Paratypes

Australia: *Victoria*: 2 specimens, from Fossil Beach, Mornington, Fyansford Formation, Balcombian, date and collector unknown (DFB 8518); 1 specimen, from the type locality, date and collector unknown (DFB 8519). 1 specimen, from the type locality, date unknown, Mr G.B. Pritchard (NMV P312806); piece of labrum, from type locality, date unknown, Mr G.B. Pritchard (NMV P312809). Muddy Creek Formation, Balcombian, Middle Miocene.

Diagnosis

Shell large, inflated, sub-triangular. Ventrum strongly convex. Labrum anteriorly and posteriorly declivous. Outer labral margin slightly angled. Inner fossular margin not delimited from inner carinal ridge.

Trivellona lochi differs from *T. darraghi* in the sub-triangular shell outline, the not-delimited inner fossular margin, and the declivous posterior labral portion. It is distinguished from *T. daphnes* by the elongated shell outline and the more numerous, finer ribs. See Table 4 for other distinguishing features.

Description

Shell of large size, light in weight, somewhat fragile, sub-triangular, globose. Spire slightly elevated, covered by 7 to 8 terminal ribs. Body whorl sub-triangular, globose, rounded, approximately 90% of total shell height; anterior terminal produced; posterior terminal slightly so. Terminal tips protruded. Dorsum highly elevated; posterior third slightly humped, completely covered by 28 to 32 fine ribs. Ribs in shape and interstices irregular. Ventrum strongly convex; terminal collars straight. Aperture relatively narrow, adapically curved. Labrum narrow, convex, roundly keeled on ventrum, widest in mid-portion, narrowing towards terminals, bearing on its inner margin 29 to 33 fine denticles (see Table 2). Outer margin of lip slightly, angularly callused, with a slight ridge on shoulder. Anterior and posterior portions of labrum declivous. Siphonal and anal

Table 2 Dimensions of *Trivellona lochi* sp. nov.

Specimens (catalogue numbers)	Length	Width	Height	Columellar teeth	Labral teeth	Dorsal ribs	
NMV P312644	30.4	23.7	20.7	?25	33	28	H
NMV P312806	28.2	21.8	19.5	22	31	32	P1
NMV P312809	broken piece of labrum					–	P2
DFB 8519	30.2	23.4	19.9	22	30	28	P3
DFB 8518A	26.5	21.3	18.6	22	29	28	P4
DFB 8518B	25.0	20.2	17.6	22	29	30	P5

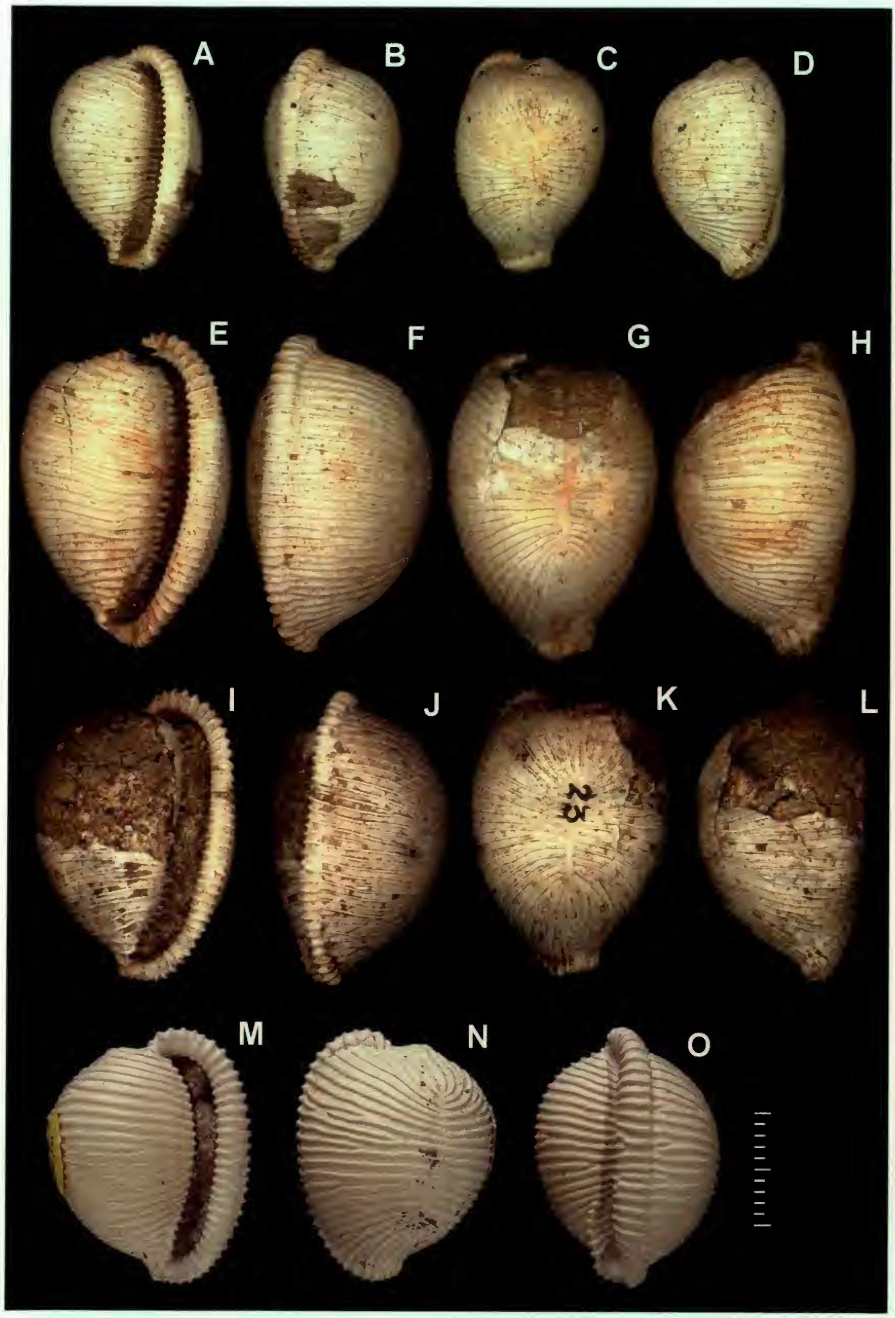

Figure 3 A–L, *Trivellona kendricki* sp. nov. from Clifton Bank, Muddy Creek, Yulecart via Hamilton, Victoria, Australia: A–D NMV P312640, holotype, × 1.2; A ventral, B left lateral, C dorsal, D right lateral (probable mature male specimen). E–H NMV P312639, paratype 2, × 1.2; E ventral, F left lateral, G dorsal, H right lateral (probable mature female specimen). I–L NMV P312634, paratype 3, × 1.2; I ventral, J left lateral, K dorsal, L right lateral (probable mature female specimen). M–O *Trivellona daphnes* (Schilder, 1966) from Port Phillip Bay between Mount Eliza and Mount Martha, Gunyong Creek (formely Grices Creek), Mornington district, Victoria, Australia: M–O BMNH G.40070, holotype, × 1.2; M ventral, N dorsal, O left lateral (photo: Caroline Hensley from BMNH).

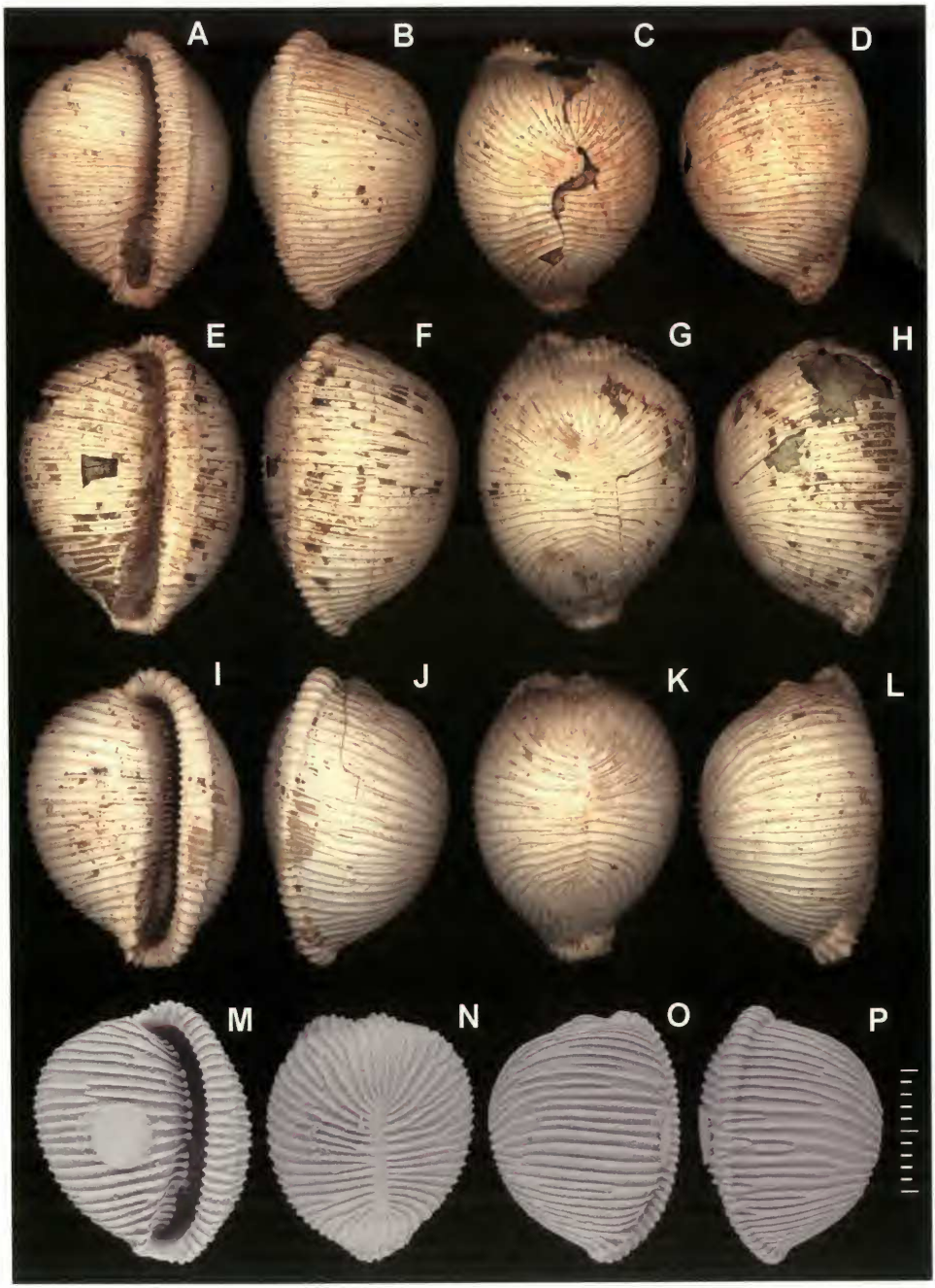

Figure 4 A–L, *Trivellona lochi* sp. nov. from Clifton Bank, Muddy Creek, Yulecart via Hamilton, Victoria, Australia: A–D NMV P312806, paratype 1, × 1.2; A ventral, B left lateral, C dorsal, D right lateral (probable mature female specimen). E–H NMV P312644, holotype, × 1.2; E ventral, F left lateral, G dorsal, H right lateral (probable mature female specimen). I–L DFB 8519, paratype 3, × 1.2; I ventral, J left lateral, K dorsal, L right lateral (probable mature female specimen). M–P *Trivellona avellanoides* (McCoy, 1867) from Port Phillip Bay between Mount Eliza and Mount Martha, Gunyong Creek (formely Grices Creek), Mornington district, Victoria, Australia: M–O NMV P5256, holotype, × 1.2; M ventral, N left lateral, O dorsal, P right lateral (photo: David Holloway).

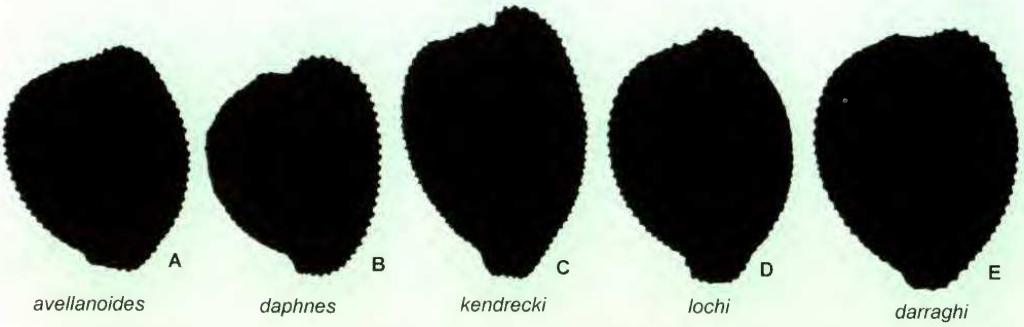

Figure 5 A–E, Outlines (ventral aspect) of the discussed large sized *Trivellona* species from the Australian Miocene: A *Trivellona avellanoides* (McCoy, 1867). B *Trivellona daphnes* (Schilder, 1966). C *Trivellona kendricki* sp. nov. D *Trivellona lochi* sp. nov. E *Trivellona darraghi* sp. nov.

Table 3 Dimensions of *Trivellona kendricki* sp. nov.

Specimens (catalogue numbers)	Length	Width	Height	Columellar teeth	Labral teeth	Dorsal ribs	
NMV P312640	22.9	16.6	14.1	23	29	34	H ♂?
DFB 5115	22.0	16.1	13.8	22	25	–	P1 ♂?
NMV P312639	32.2	23.4	19.6	25	35	–	P2 ♀?
NMV P312634	29.8	21.7	17.9	–	33	34	P3 ♀?

canals follow shell profile, both bordered adapically and abapically by ventral side-walls; siphonal canal sharply edged. Anal canal obscured. Both canals are bordered adapically and abapically by ventral side-walls, anterior side wall sharply edged. Columella straight, tapering steeply inwards, bordered internally by a weak carinal ridge, bearing 22 to 25 ribs (see Table 2), which continue onto the carinal ridge, where they become considerably finer. Fossula concave. Inner fossular edge and fossula not clearly delimited from rest of columella.

Etymology

The name of the species honours Mr Ian Loch of the Australian Museum, Sydney, New South Wales.

Trivellona kendricki sp. nov.

Figures 3A–L, 5C

Material examined

Holotype

Australia: ***Victoria***: from Clifton Bank, 'Clifton' property, Muddy Creek, Yulecart via Hamilton, 1981, Mr L. Elmore, 1981 (NMV P312640). Muddy Creek Formation, Balcombian, Middle Miocene.

Paratypes

Australia: ***Victoria***: 1 specimen, from the type locality, date and collector unknown (DFB 5115);1 specimen, from the type locality, date unknown, Mrs M. Robertson (NMV P312639); 1 specimen, from the type locality, date unknown, Mr G.B. Pritchard (NMV P312634). Muddy Creek Formation, Balcombian, Middle Miocene.

Diagnosis

Shell large, pyriform, with an elevated spire. Ventrum slightly convex. Labrum anteriorly and posteriorly declivitous. Outer labral margin roundly edged. Inner fossular margin not delimited from inner carinal ridge. It differs from *T. darraghi* and *T. lochi* by its pyriform shell outline, less developed dorsal sulcus and especially from *T. darraghi* by its not-delimited inner fossular margin. See Table 4 for other distinguishing features.

Description

Shell medium in size, light weight, somewhat fragile, slightly pyriform. Spire somewhat elevated, covered by 4 to 6 terminal ribs. Body whorl somewhat pyriform, globose, rounded, approximately 90% of total shell height; anterior terminal produced; posterior terminal slightly so. Terminal tips protruded. Dorsum evenly rounded, regularly elevated, completely covered by 38 to 42 fine ribs. Ventrum slightly convex; terminal collars straight. Aperture relatively narrow, straight. Labrum narrow, convex, flattened on ventrum, anteriorly

Table 4 Differences in shell morphology of *Trivellona* spp.

Feature	*T. avellanoides*	*T. daphnes*	*T. darraghi*	*T. kendricki*	*T. lochi*
Shell length	16–21 mm	21–24 mm	19–49 mm	22–33 mm	25–31 mm
shell outline	slightly squarish	rounded triangular	somewhat rectangular	elongated pyriform	elongatedly sub-triangular
dorsal sulcus	deepened, smooth restricted area	deepened, ribs bisected or depressed	somewhat obsolete, ribs slightly depressed	narrow smooth area	irregularly deepened, ribs bisected
ribs	somewhat coarse, few, irregular, wide interstices	somewhat coarse, slightly numerous, irregular, wide interstices	numerous, fine, close-set	numerous, fine, close-set	irregular, numerous, fine, close-set
No. of dorsal ribs	18–22	20–24	22–26	38–42	28–32
labrum	narrow, widely curved, ventrally angularly rounded	narrow, widely curved, flattened	narrow, mid-portion straight, ventrally rounded, anteriorly flattened	narrow, mid-portion somewhat straight, flattened	narrow, mid-portion somewhat straight, ventrally rounded, anteriorly and posteriorly declivous
posterior labral portion	follows shell profile	strongly projected	projected	projected	strongly projected
inner fossular margin	follows carinal ridge	follows carinal ridge	slightly projected	follows carinal ridge	follows carinal ridge

and posteriorly slightly declivous. Outer margin of lip slightly, angularly callused. Labrum posteriorly projecting, bearing on its inner margin 25 to 35 fine denticles (see Table 3). Siphonal and anal canals follow shell profile. Anal canal almost obscured. Siphonal canal bordered ventrally by a sharply edged side-wall. Columella straight, narrow, tapering steeply inwards, bordered internally by a carinal ridge. Parietal lip slightly edged, bearing 22 to 25 ribs (see Table 3), which continue onto the carinal ridge, where they are slightly T-shaped. Fossula concave. Inner fossular edge and fossula not clearly delimited from the rest of the columella.

Etymology

The name of the species honours Mr George W. Kendrick of the Western Australian Museum, Perth.

REFERENCES

Darragh, T.A. (1985). Molluscan biogeography and biostratigraphy of the Tertiary of southeastern Australia. *Alcheringa* **9**: 83–116.

Darragh, T.A. (2002). A revision of the Australian Genus *Umbilia* (Gastropoda: Cypreaidae). *Memoirs of Museum Victoria* **59**: 355–392.

Fehse, D. and Grego, J. (2004). *Contributions to the knowledge of the Triviidae (Mollusca: Gastropoda). IX. Revision of the genus* Trivellona *Iredale, 1931.* Published by the authors: Berlin-Banska Bystrica.

Gostin, V.A. (1966). Tertiary stratigraphy of the Mornington District, Victoria. *Proceedings of the Royal Society of Victoria* **79**: 459–512.

Iredale, T. (1931). Australian Molluscan Notes, No. 1. *Records of the Australian Museum* **18**: 201–235.

Schilder, F.A. (1933). Beiträge zur Kenntnis der Cypraeacea (Moll. Gastr.), 19. Das Genus *Trivirostra* Jousseaume. 20. Cypraeacea von Neu-Pommern. *Zoologischer Anzeiger* **102**: 288–303.

Schilder, F.A. (1935). Revision of the Tertiary Cypraeacea of Australia and Tasmania. *Proceedings of the Malacological Society London* **21**: 325–355.

Schilder, F.A. (1966). Neue fossile Cypraeacea und Triviacea aus Australien. *Archiv für Molluskenkunde* **95**: 269–274.

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